

### **REMARKS**

The Official Action mailed July 10, 2008 has been carefully considered. Reconsideration and allowance of the subject application, as amended, are respectfully requested.

As an initial matter, the drawings were objected to on the grounds that they did not show the feature of "full area contact" of the supporting surface with the supporting flank (Claims 1, 25 and 26) and "full area contact" of the sealing surface with the supporting flank (claim 27). Claims 1 and 25-27 have been amended to remove the words "and full" from the phrase "flat and full area contact" to overcome the above objection. Accordingly, no new matter has been entered. It is believed that removing this feature also addresses the rejection of claims 1, 4-7, 9-11, 14-23 and 25-27 under 35 U.S.C. § 112, first paragraph, on the grounds that they do not comply with the enablement requirement.

In addition, claims 1 and 25-27 have been amended to recite that "the supporting surface of the sealing ring, minus the area of said supporting surface corresponding to the first gap width, can be brought into flat ~~and full~~ area contact with the supporting flank of the groove, minus the area of said supporting flank corresponding to the second gap width, at least on the side facing the sealing surface." Support may be found in FIG. 1a. Accordingly, no new matter has been entered.

Further, claims 25-27 have been amended to recite "wherein said sealing surface being in sealing contact with one of said two components provides a sealing area and wherein said sealing area is provided when said supporting surface of said sealing ring is in flat area contact with said supporting flank of said groove." Support may be found at page 15 lines 9-13 which recite "[i]n this context, the full area of sealing surface 2 is in contact with component 6 to be sealed, where components 4 and 6 can be capable of rotary movement or axial displacement relative to each other." A new claim 28 has been entered adding this limitation to claim 1. Accordingly, no new matter has been entered.

Claims 1, 4-7, 9-11 and 14-23 were rejected under 35 U.S.C. § 112, second paragraph, on the grounds that the phrase in line 7 and line 9 of claim 1 recites "a supporting flank" and is seen by the Examiner as indefinite. It appears that such a phrase is actually in line 6 and line 9 of

claim 1. Claims 1, 4-7, 9-11, 14-21 and 25-27 have been amended to provide appropriate antecedent basis to the claims. Accordingly, no new matter has been entered.

Claim 1 has been amended to recite “wherein said sealing ring is capable of radial compression towards said radially internal sealing surface , or of expansion towards said radially external sealing surface.” Support may be found in the Abstract and in original claim 1. Accordingly, no new matter has been entered.

In addition, claims 1 and 25-27 have been amended to recite a first gap width and a second gap width. Support may be found at paragraph [0030] of the published U.S. application which recites “[t]he pressure-side gap furthermore preferably displays a constant gap width, which can, for example, be in the region of 1 mm or less, less than 0.5 mm, or less than 1/10 mm. It goes without saying that the gap width must be selected suitably in accordance with the respective fluid medium, the respective operating pressure and the sealing ring diameter ” and at paragraph [0049] of the published U.S. application which recites “[t]he width of gap 12 existing between components 4 and 6, which move relative to each other, roughly corresponds to one-tenth of the thickness of the sealing ring, the width of gap 10 corresponding to roughly half the width of gap 12.” Accordingly, no new matter has been entered.

Claims 1 and 25-27 have further been amended to recite that the sealing ring has “a generally triangular or trapezoidal cross-section”. Support may be found at paragraph [0019] which recites “[t]he sealing surface of the sealing ring is preferably the surface with the greatest width referred to the cross-sectional view of the sealing ring, i.e. the hypotenuse in the case of an essentially triangular sealing ring, or, in the case of an essentially trapezoidal sealing ring, preferably the base surface with the greater length in the cross-sectional view.” Accordingly, no new matter has been entered.

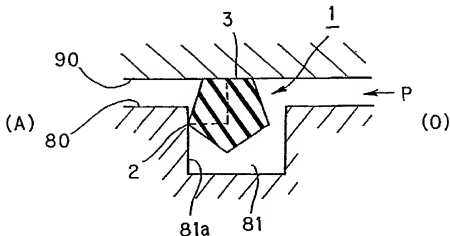
Claim 25 has been objected to on the grounds that line 14 starting with “wherein the second gap” should be placed after paragraph 7 in claim 25. This has been done and no new matter has been entered.

Claim 27 has been objected to on the grounds that paragraph 3 starting with “wherein the second gap” should be placed after paragraph 6 in claim 27. This has been done and no new matter has been entered.

Claims 1, 4-7, 9, 11, 14-20, 22, 23 and 25-27 were rejected under 35 U.S.C. 103(a) as being unpatentable over Abiko (WIPO Pub. No. WO01/84024 A1) in view of newly cited Reiners (USP 3,104,594).

Abiko appears to be directed at a seal ring that has been cut to include a projecting part and a recessed part and which may seal by linear contact against an annular groove, however, the groove is shown as having square sides rather than a pressure-side flank and a supporting flank which correspond to a supporting surface and a pressurizing surface of a sealing ring which are inclined relative to the surface of the sealing ring, each enclosing an angle of  $30^{\circ}$  to  $60^{\circ}$  towards the sealing surface, as recited in amended claims 1 and 25-27. This was one feature of dependent claim 3 which was not earlier rejected as being anticipated by Abiko. In addition, claims 1 and 25-27 have been amended to recite that the sealing ring has a generally triangular or trapezoidal cross-section. Akibo discloses a regular polygon having 4, 5 or 6 sides.

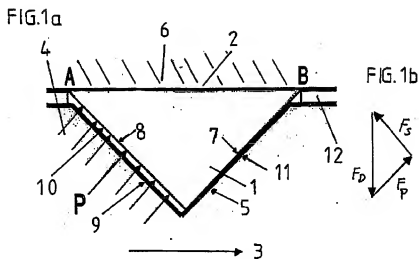
Further, Akibo teaches linear contact of the ring body (at 2 in FIG. 2) with a side surface 81a of the annular groove 81 (see column 3 lines 18-21 and FIG. 2, reproduced below).



This linear contact is further disclosed at column 2, lines 66-67; column 6 lines 3, 21, 39 and 46 and column 7 lines 4, 16 and 42.

The Office Action specifically references **FIG. 9** of Akibo as anticipating claim 1, however **FIG. 9**, as described at column 2 lines 24-33, describes a contact condition between the seal ring and side surface wall as linear.

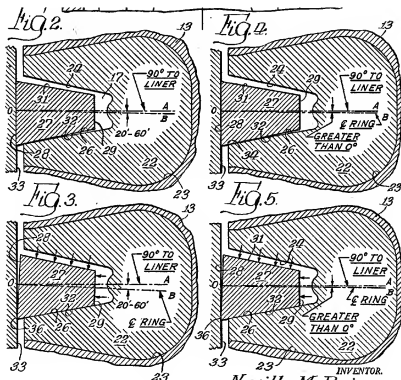
In contrast, and as recited in amended claims 1 and 25-27, the present invention is directed at flat area contact between a supporting surface **7** of a sealing ring **1** and a supporting flank **11** of a groove **5** in a component **4**. This is illustrated below in **FIG. 1a** of the present application.



Akibo actually teaches against such area contact reciting at column 7 lines 15-20 that “[i]t is sufficient that the cross section has a shape contacting in a *linear* manner with the side wall surface **81a** of the annular groove **81** for sealing and a part of the two cut end portions extending

in the circumferential direction as described above is a part of the linear seal portion.” Thus the pressurizing force is not transferred over the full sealing area of the sealing surface.

Reiners (newly cited) appears to be directed at a piston and a ring in a groove that engages a cylinder wall. The ring may twist due to operating conditions such that less than full area contact between the face 28 and the cylinder wall 33 (see FIGS. 3 and 5 below) or between the lower side 32 of the ring and the lower side of the groove 26 may occur (see FIGS. 2 and 4 below).



Claim 1 of the present application has been amended to recite “wherein said sealing ring is capable of radial compression towards said radially internal sealing surface, or of expansion towards said radially external sealing surface.” This compression allows the sealing ring of the present invention to maintain flat area contact with the surface of the first component and the supporting surface with the supporting flank. It is clear that the ring of Reiners does not compress

or it would conform to the cylinder wall and lower side of the groove and not display, for instance in **FIGS. 2 and 4**, contact of the ring **27** with the lower side **26** of the groove **17** *only at* the outer edge **34** (see column 3 of Reiners, lines 31-35 and 68-70). The same is true for the gap between the ring and cylinder wall in **FIGS. 3 and 5** at **28** (see column 3 lines 51-53).

Further, Reiners does not teach or suggest that the surface area of the sealing ring enables the compression/expansion of the sealing ring when said supporting surface of said sealing ring is in flat area contact with said supporting flank of said groove. See **FIG. 1b** above. In the present invention, due to the claimed inclination angles of the supporting surface or of the supporting surface and the pressurizing surface in combination with the flat area contact of the supporting surface to the supporting groove flank, under pressurization of the sealing ring the sealing surface is pressed with a high force against the corresponding component, achieving a highly reliable seal. Reiners only discloses a sealing surface being in contact with the corresponding component due to the twisting motion of the sealing ring and not due to the supporting surface of the sealing ring being in flat area contact with the supporting flank of the groove. In Reiners there is only line contact (note the gaps at **28** and **26** in **FIGS. 2-5**, above), providing a less reliable seal. Thus the pressurizing force is not transferred over the full sealing area of the sealing surface.

Claims 25-27 also recite that the sealing ring is capable of compression.

It is submitted that for dependent claim 10, the art of Flick (US 2,970,871) does not make up for the deficiencies of Akibo and Reiners. Similarly for dependent claim 21, the art of Freudenthal (US 4,618,154) does not make up for the deficiencies of Akibo and Reiners.

Claims 4-7, 9-11 and 14-23 depend directly or indirectly from amended claim 1 and are therefore similarly distinguished.

It is submitted that the amendments to the claims as presented herein overcome the rejections under 35 U.S.C § 103 and thus distinguish the present invention over the cited art.

Having dealt with all the objections raised by the Examiner, it is respectfully submitted that the present application, as amended, is in condition for allowance. Thus, early allowance is earnestly solicited.

AMENDMENT AFTER FINAL OFFICE ACTION

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Filing Date: March 15, 2004

Title: Sealing Ring and Sealing Ring Arrangement

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If the Examiner desires personal contact for further disposition of this case, the Examiner is invited to call the undersigned Attorney at 603.668.6560.

In the event there are any fees due, please charge them to our Deposit Account No. 50-2121.

Respectfully submitted,

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